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## TITLE OF THE INVENTION

### PRODUCT DISPENSING HEAD AND PACKAGING WITH VARIABLE FLOW

## CROSS-REFERENCE TO RELATED APPLICATIONS:

**[0001]** This document claims priority to French Application No. 02 09448, filed July 25, 2002 and U.S. Provisional Application No. 60/407,297, filed September 3, 2002, the entire content of which is hereby incorporated by reference.

## FIELD OF THE INVENTION

**[0002]** The present invention relates to a product dispenser and packaging in which a dispensing head for the product is designed to actuate a dispensing element mounted on a receptacle, preferably a valve mounted on a pressurized container, for dispensing a product contained in the receptacle. In particular, the invention provides a dispensing head enabling the product to be dispensed with at least two different flowrates.

## BACKGROUND OF THE INVENTION

### DISCUSSION OF BACKGROUND

**[0003]** Dispensing heads of the general type to which the invention pertains are known, notably in U.S. patents 3,363,968 and 3,703,994.

**[0004]** The dispensing head described in U.S. patent 3,363,968 utilizes a collar attached to the receptacle and a push button which moves axially to actuate a valve stem. The push button is mobile in rotation relative to the collar between two dispensing positions delivering two different flow-rates. To this end, the push button is penetrated transversely by a conduit which terminates at its two extremities by apertures of different cross-sections. When the push button is pressed, the conduit is designed to be aligned with a channel, formed in the

collar, which emerges via a dispensing aperture. The user places the push button at an angle relative to the collar such that one or the other of the apertures in the conduit is aligned with the channel so as to dispense the product at the selected flow-rate when the push button is pressed.

**[0005]** The dispensing head described in U.S. patent 3,703,994 utilizes a collar designed to move axially relative to the receptacle in response to the depression of a push button mounted on the collar and designed to actuate a valve. The push button is also mobile in rotation relative to the collar between three dispensing positions delivering three different flow-rates. The collar incorporates an axial conduit which communicates with the inside of the receptacle, when the valve is actuated, and which emerges laterally via three apertures of different cross-sections, with each of the apertures emerging above an element termed the "centerpost." The push button includes a spray nozzle which, in each dispensing position, is aligned with a centerpost. A conduit of complementary shape is integral with the push button and is inserted into the conduit in the collar. The conduit in the push button incorporates an axial slot which, in each dispensing position of the push button, is aligned with one of the apertures. However, the necessary clearance between the nozzle and each centerpost to allow the push button to rotate between the three positions prevents the nozzle from being correctly positioned at each centerpost so that it is difficult to obtain a good spray. Furthermore, such a clearance makes it impossible to align the nozzle in an identical manner with the different centerposts so that it is very difficult to obtain a reproducible spray for one or more of the positions. Furthermore, the conduit connecting the valve to the nozzle defines a relatively large volume so that, after the user has released the push button, all of the product remaining in this volume is dispensed.

**[0006]** U.S. patent 2,887,273 also describes a dispensing head incorporating a diffuser attached to the receptacle and to the valve stem, and a push button designed to actuate the

valve stem. The push button is mobile in rotation relative to the diffuser in two dispensing positions delivering two different flow-rates. To this end, the diffuser incorporates two diametrically opposed spray orifices of different cross-section, and the push button has an aperture in its wall designed to align with one or other of the spray orifices. When the push button aperture is aligned with one of the orifices, the other orifice is blanked off by a wall of the push button. This configuration requires two spray orifices which complicates the manufacture of the dispensing head as such orifices are more difficult to make than a simple hole.

#### SUMMARY OF THE INVENTION

**[0007]** It is an object of the invention to provide a dispensing head which can avoid one or more, preferably all, of the drawbacks of the prior art.

**[0008]** A further object of the invention is to provide a new dispensing head enabling a product to be dispensed with at least two different flow-rates.

**[0009]** Another object of the invention is also to provide a dispensing head that is simple and inexpensive to produce.

**[0010]** A further object of the invention is to provide a dispensing head that is capable of switching readily from one dispensing position to another dispensing position.

**[0011]** According to the invention, the above and other objects can be achieved by providing a dispensing head having an axis X designed to actuate a dispensing element mounted on a receptacle and to dispense a product contained in the receptacle. The head includes an arrangement (or first assembly) to attach the head onto the receptacle. A dispensing conduit is capable of communicating with the product inside the receptacle, and includes at least two passages of different cross sections. In accordance with an example of a preferred form, the conduit can be formed by molding from a single piece with the

attachment arrangement integral therewith via a deformable connection arrangement. The assembly is also arranged to actuate the dispensing element and to cause the conduit to communicate with the inside of the receptacle. The actuating arrangement provides a second assembly. The actuating arrangement has a dispensing orifice formed at the extremity of a channel with a length greater than the diameter of the dispensing orifice, with the actuating arrangement being mobile relative to the conduit between at least two positions. In a first position the dispensing orifice communicates with one of the passages, and in a second position the dispensing orifice communicates with the other passage (or another of the passages where more than two are provided).

**[0012]** The objects of the invention can also be achieved by a dispensing head having an axis X and designed to actuate a dispensing element mounted on a receptacle and to dispense a product contained in the receptacle. This arrangement includes an arrangement to attach the head onto the receptacle. A dispensing conduit is capable of communicating with the product inside the receptacle, and has at least two passages of different cross-sections. By way of example, the conduit can be formed by molding as a single piece with the attachment arrangement integral therewith via a movable or deformable arrangement. An arrangement is also provided to actuate the dispensing element and to cause the conduit to communicate with the inside of the receptacle. The actuating arrangement includes a dispensing orifice defined by an attached nozzle, and is mobile relative to the conduit between at least two positions. In a first position the dispensing orifice communicates with one of the passages, and in a second position the dispensing orifice communicates with the other (or another) passage.

**[0013]** It is to be understood that passages of different cross-sections means passages which emerge to apertures having a different surface areas.

[0014] It is also to be understood that dispensing orifice means the diameter of the circle when the orifice is circular, or the diameter of the circle circumscribed within the cross-section of the orifice when the latter has a shape other than circular.

[0015] The presence of an elastically deformable connecting arrangement makes it possible to produce a conduit by a molding process from a single piece with the attachment arrangement, while being capable of moving relative to the attachment. Such a part is simple and inexpensive to produce.

[0016] Furthermore, the dispensing head is simple and inexpensive to make in that it requires only a single spray orifice formed in the actuating means, and in that the two passages of different cross-section are easy to produce as they can be formed during molding of the conduit. Advantageously, the connecting arrangement is preferably elastically deformable so that it reverts to an initial position when the load causing deformation is removed.

[0017] Advantageously, the attachment arrangement is preferably fixed axially on the receptacle in a manner such that the head is correctly held on the receptacle.

[0018] The connecting arrangement allows movement of the conduit in response to actuation. In a preferred embodiment, the connecting arrangement is formed by a transverse wall relative to axis X, with the wall corrugated. This configuration of the wall enables it to deform easily and to revert easily to its initial position.

[0019] The conduit has an axis X and includes a first extremity which carries the actuating arrangement and a second extremity capable of engaging with the dispensing element of the receptacle. Thus, the conduit directly transmits the pressure exerted on the actuating arrangement to the dispensing element.

[0020] The passages can be slots extending parallel to the axis X, which are of a different width and spaced at different angular positions. However, it is to be understood that any

other form of passage can be used. The actuating arrangement is movable in a rotational direction about the axis X between the first and second positions.

**[0021]** In accordance with one example of the invention, the dispensing head can be advantageously configured so as to allow the dispensing element to be actuated only when the actuating arrangement is in the first and second positions. To this end, the dispensing head can include an axial stop against which the actuating arrangement bears when it is not in either of the first or second positions so as to prevent actuation of the dispensing element. Advantageously, the dispensing head can include at least two radial stops limiting the rotational movement of the actuating arrangement.

**[0022]** In accordance with another preferred option, the dispensing head can advantageously also include an arrangement to provide audible identification to indicate placement of the assembly in either of the first and second positions. The audible identification can be provided, for example, by the engagement of a first projection formed on the actuating arrangement and a second projection integral with the conduit, the first projection being capable, when the actuating arrangement moves relative to the conduit, of making contact with the second projection and elastically deforming the latter as it passes across it, thereby producing an audible signal. The dispensing head can also optionally include visual identification means to identify the first and second positions.

**[0023]** The invention also provides a packaging and dispensing unit for a product. The package includes a receptacle containing the product and is fitted with a dispensing element. In particular, a dispensing head as described above can be provided, and designed to actuate the dispensing element in order to dispense the product. The receptacle can be pressurized and the dispensing element can be a male valve incorporating a valve stem onto which the conduit is fitted, or a female valve, i.e., without a valve stem, into which the conduit is

inserted. Alternatively, the receptacle can be at atmospheric pressure and equipped with a pump.

[0024] The invention is particularly useful for the packaging and dispensing of a cosmetic or personal care product, notably a hair product.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0025] Other objects, features and advantages of the invention will become apparent from the following detailed description, particularly when considered in conjunction with the drawings in which:

[0026] Figure 1 is a perspective view of an embodiment of a packaging and dispensing unit fitted with a dispensing head according to the invention;

[0027] Figure 2 is an exploded view of the embodiment illustrated in figure 1;

[0028] Figure 3 shows a top view on arrow 3 of part of the dispensing head illustrated in figure 2;

[0029] Figure 4 shows an axial cross-section of the dispensing head in the closed position;

[0030] Figure 5 shows an axial cross-section of the dispensing head in a dispensing position, with the valve not actuated;

[0031] Figure 6 shows a detail of the dispensing head on passing from the closed position to the dispensing position;

[0032] Figure 7 shows an axial cross-section of the dispensing head in a dispensing position, with the valve actuated; and

[0033] Figure 8 shows a variant of the conduit formed on the collar of the dispensing head.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0034]** Non-limiting examples of the invention will now be described with reference to the drawing figures. It is to be understood, however, that various modifications are possible and the invention is not limited to the specific examples illustrated.

**[0035]** The packaging and dispensing unit illustrated in figures 1 to 7 is composed of a pressurized container 30, partially illustrated in figures 2, 4, 5 and 7, on which a dispensing head 1 according to the invention is attached and which can be closed by means of a cap 40. The receptacle 30 is formed by a pressurized can having an axis X, formed by a body 31 of cylindrical shape of which the upper end is closed by a collar 32 crimped onto a rolled edge 33 of the receptacle. As noted earlier, however, the container need not be pressurized. In addition, the container could have different shapes and forms.

**[0036]** The collar 32 is fitted with a valve 34 which includes a hollow valve stem 35 and which can be actuated, for example, by depressing the valve stem. It is evident that a valve actuated by a rocking motion of the valve stem can alternatively be used. The receptacle 30 can contain a product to be sprayed, for example a cosmetic product, and a propellant gas, which may or may not be stored in liquefied form in the receptacle 30 and which may or may not be dispensed with the product. The product thus emerges in spray form, i.e., in the form of fine particles in suspension either in the gas or in the air.

**[0037]** The dispensing head 1 also has an axis X and is composed of two parts (or first and second assemblies) which are movable relative to each other between two positions each enabling a product to be dispensed at a different flow-rate. The first part of the head is composed of a collar 10 to protect the valve stem and designed to be attached to the receptacle. The second part includes a push button 20 to actuate the valve and which is mobile in rotation relative to the collar. Each of the two parts is preferably obtained by molding of a thermoplastic material from a single piece.



[0038] The collar 10 includes a fixing skirt 11 (see, e.g., figures 4, 5 and 7) to attach the head to the receptacle. The fixing skirt 11 is fitted with an annular bead 110 on the inner wall permitting snap-on attachment to the receptacle under the rolled edge 33 of the receptacle and cup 32. The fixing skirt 11 has a radial step 111 towards the inside of the skirt and extends axially above the step to an upper extremity from which a transverse wall 12 is formed. Radial fins 13, spaced at angles around the periphery of the inner surface of the fixing skirt, extend parallel to axis X from the step 111 to a bottom free edge 130. The free edge 130 is designed to bear against the receptacle when the collar is mounted on the receptacle, as can be seen in figures 4, 5 and 7. The fins 13 thus serve to limit the axial penetration of the collar when it is snapped onto the receptacle. The transverse wall 12 is a thin wall which is corrugated so as to be elastically deformable, enabling it to deform when axial load is applied to it. The wall 12 is traversed at its center by a conduit 14 formed on axis X.

[0039] The conduit 14 extends from one side of the transverse wall 12 to the other from an open lower extremity 14a fitted onto the valve stem 35, to an upper extremity 14b, also open, onto which the axial skirt 23 of the push button is fitted. An annular groove 14c is incorporated in the outer surface of the conduit 14 to receive an annular bead 23a on the inner surface of the axial skirt 23 of the push button so as to maintain the axial position of the push button on the collar. In addition, engagement of the annular bead 23a with the annular groove 14c ensures a leaktight seal between the conduit and the inside of the push button.

[0040] The conduit 14 is cylindrical in shape and defines at its lower part a recessed seating designed to engage in an effectively leaktight manner with the upper part of the valve stem 35 the upper extremity 35a of which bears against the recessed seat. The lower extremity 14a of the conduit is slightly tapered to facilitate placement of the conduit on the valve stem. The upper extremity 14b includes two axial slots or passages 15a and 15b (figure 3) of different widths which define two passages for the product of different cross-sections

allowing the product to emerge at two different flow-rates. It is evident that it is possible to provide as many slots of different widths to obtain as many different flow-rates as desired. In the particular illustrated arrangement, by way of example, the two slots 15a and 15b are spaced at angles of approximately 80°.

**[0041]** According to a variant illustrated in figure 8, the upper extremity 14b of the conduit can include a first passage 15a formed by a slot emerging into an aperture of larger cross-section. The upper extremity 14b also includes a second passage 15b for the product, longer than the first and terminating in a second aperture in the form of a groove of smaller cross-section than the aperture of the first passage. This groove is connected to the first slot by a step 60 formed at the upper extremity of the conduit 14. In this variant, the product emerging from conduit 14 is directed to the second aperture by part of the first slot 15a and by the step 60.

**[0042]** The fixing skirt 11 is connected in the region of the step 111 by an annular transverse wall 16 to an outer skirt 17 concentric with the fixing skirt 11. The outer skirt 17 is designed to form an extension to the receptacle wall when the dispensing head is mounted on the receptacle. Two marks M are provided on the outer surface of this skirt 17 to visually indicate the angular positions of the two slots 15a and 15b. A first mark M is, for example, the number "1" which corresponds to the position of the slot 15b of smaller width and which therefore allows the product to be delivered at a low flow-rate, and a second mark M is, for example, the number "2" which corresponds to the position of the wider slot 15a which therefore allows the product to be delivered at a higher flow-rate. The outer skirt 17 includes a shoulder 170 and extends axially above this shoulder by an axial crown 171. The crown 171 incorporates an annular bead 172 on its outer wall permitting attachment of the closure cap 40 by snapping into an annular groove 410 on the inner surface of the side wall 41 of the cap.

With the cap mounted on the dispensing head, the side wall 41 of the cap forms the extension of the outer skirt 17 and the free edge 411 of the cap bears against the shoulder 170.

The annular transverse wall 16 of the collar is traversed by two curved apertures 18 and 19 diametrically opposed on the annular transverse wall, formed in proximity to the outer skirt 17, and in which two lugs associated with the push button are designed to move, as will be described in detail below.

**[0043]** The first aperture 18 (figure 3) is formed on the side facing the axial slots 15a and 15b in the conduit and the second aperture 19 is formed behind the axial slots 15a and 15b.

The second curved aperture 19 terminates, in proximity to each end of the curve, in two aperture portions 19a and 19b which extend aperture 19 radially inward. The aperture portions 19a and 19b are spaced at an angle of approximately 80° and are each formed respectively according to the diameter or axis passing through each to the axial slots 15a and 15b. The portion 160 of the annular transverse wall 16 situated between each aperture portion 19a and 19b serves as an axial stop for the push button as will be seen in detail below.

Two vertical stops 190a and 190b border each outer edge of each aperture portion 19a and 19b, respectively. The stops 190a and 190b extend axially from the annular transverse wall 16 to an upper free edge, and extend radially from the outer surface of the fixing skirt 11 to the slot 19. The stops 190a and 190b are relatively rigid by virtue of the fact that they are integral both with the annular transverse wall 16 and the fixing skirt 11, and thus serve to limit the rotational movement of the push button. Two radial tabs 191a and 191b extend axially from the annular transverse wall 16 to one upper free edge 191a' and 191b'. They are formed on the side facing the inner edge of each aperture portion 19a and 19b. The tabs 191a and 191b extend to an axial height less than that of the stops 190a and 190b and are also narrower than the stops 190a and 190b. The tabs 191a and 191b do not extend as far as the curved aperture 19 and are set back from the fixing skirt 11 so that they are elastically

deformable. The tabs 191a and 191b work in conjunction with the push button to constitute an audible means of identification to indicate that the working position has been reached. To actuate the valve, the dispensing head includes a push button 20 incorporating an upper surface 21 designed to form a bearing surface for the user's finger. The upper surface 21 is connected at its periphery to a first skirt 22 of smaller inside diameter than the diameter of the outer skirt 17 of the collar.

**[0044]** The push button 20 includes, inside the first skirt 22, a second skirt 23 having a cylindrical shape. The skirt 23 is centered on the axis X and fits onto the upper extremity 14b of the conduit 14 around which it rotates. The upper part of the skirt 23 receives, via a first extremity 24a, a substantially radial channel 24, the second extremity 24b of which terminates in a nozzle mount. In the illustrated example, the nozzle mount includes a pin 25 or "centerpost" onto which a conventional swirl-channel nozzle 50 can be attached. The nozzle 50 defines a dispensing orifice 51. An arrow F is provided on the upper surface 21 to indicate the angular position of the extremity 24a of the channel 24, so that when it is aligned with one or other of the marks M on the collar, the user has a visual indication of the two positions in which he/she can operate the push button to dispense the product.

**[0045]** A pintle 26 centered on axis X is formed inside the second skirt 23 and is inserted inside the conduit 14 when the push button is fitted on the collar. The pintle 26 has a diameter slightly smaller than that of the conduit so as to form an annular passage for the product inside the conduit. The pintle 26 serves to limit the dead volume inside the conduit and thus limit charge losses inside the conduit so as to optimize the flow-rate at which the product is released. In addition, reducing the dead volume has the effect of reducing the volume of product which the dispensing head is able to hold between the valve 34 and the dispensing orifice 51. Thus, the discharge of product spray through the dispensing orifice

stops substantially at the same instant as the user releases the push button, i.e., the valve is no longer open because the quantity of product remaining inside the head is relatively small. The side skirt 22 of the push button extends axially at its lower end, at two diametrically opposite angular points, to form two lugs 27 and 28 each respectively designed to move in the curved apertures 18 and 19 in the collar.

[0046] Each lug 27 and 28 terminates at its lower end in a hook 270 and 280 which rests under the annular transverse wall 16 when the lugs 27 and 28 pass through the apertures. The hooks 270 and 280 serve to hold the push button axially on the collar. Lug 27, situated on the side where the dispensing orifice 51 is located, is designed to move in curved aperture 18. Lug 28 is designed to move in curved aperture 19. Lug 28 includes a rib 281 whose axial length and radial length are sufficient to bear against each stop 190a and 190b when the push button rotates on the collar. The rib 281 incorporates a shoulder 281a at its lower part which enables it to stand off from the vertical edge of the tabs 191a and 191b. However, the shoulder 280a comes into contact with the upper free edges 191a' and 191b' of each tab 191a and 191b and elastically deforms them as it passes, as can be seen in figure 6, so as to produce an audible signal.

[0047] In the storage position illustrated in figures 3 and 4, the conduit 14 blocks the extremity 24a of the channel 24 so as to prevent any communication between the outlet orifice 51 and the inside of the dispensing conduit 24. In this position, the lug 28 passes through the slot 19 and is located between the two apertures 19a and 19b. The lower end of the rib 281 formed on the push button bears axially against the portion 160 of the annular transverse wall 16 so that if the user presses the push button 20 the latter cannot move downward and cannot therefore actuate the valve 34. To dispense the product, the user turns the push button 20 about the axis X so as to position the arrow F opposite one of the marks M. If it is wished to spray the product at a relatively high rate of flow, the mark "2" is selected so

that slot 15a is aligned with extremity 24a of the channel 24. As the push button rotates, lug 27 moves in the curved aperture 18 and lug 28 moves in the curved aperture 19 until shoulder 281a of the rib 281 comes into contact with tab 191a and, by virtue of its elasticity, moves past it to bear against stop 190a, emitting an audible signal indicating to the user that the push button is set at a dispensing position. In this position illustrated in figure 5, the rib 281 is located above aperture 19a and the dispensing orifice 51 is in communication with the inside of the conduit 14 via slot 15a.

[0048] The user can then actuate the valve by pressing the push button as illustrated in figure 6. By pressing on the upper surface 21, the rib 281 of tab 28 enters the aperture portion 19a whilst tab 27 remains attached to the transverse wall 16 by virtue of the hook 270. The skirt 23 is then displaced by a movement, for example having an axial and radial component in the illustrated embodiment. This movement causes the conduit 14 on which it is mounted to move, the movement of the conduit being possible by virtue of the fact that the wall 12 deforms. The lower extremity 14a of the conduit in turn exerts pressure on the valve stem 35 which moves downward thereby actuating the valve 34. Product contained in the receptacle then leaves the receptacle via the interior channel of the valve stem and arrives at the dispensing orifice 51, passing through conduit 14 and channel 24. When the user releases the push button, the valve stem rises and the flow of product is interrupted.

[0049] When the user has finished using the spray, he/she turns the push button to a position between the two dispensing positions before replacing the cap 40. A third mark M, not shown, indicating this closed position can be provided between the two dispensing marks M.

[0050] In the foregoing detailed description, reference is made to preferred embodiments of the invention. It is evident that variants can be introduced thereto without departing from the spirit of the invention. Obviously, numerous modifications and variations of the present

invention are possible in light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.